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Biology and Predatory Potential of a Reduviid Predator, *Oncocephalus annulipes* Stal. (Hemiptera : Reduviidae)

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ABSTRACT

The biology and predatory potential of Oncocephalus annulipes Stal., an alate, entomophagous, multivoltine assassin bug predating on several insect pests was studied in the laboratory. The insect laid pale luteous, oval eggs with creamy white concave operculum without any cementing material 14 days after emergence. The eggs hatched in 7 to 24 days and the pale ochraceious nymphs acquired dark grey colour with annulations in appendages within 1 h. Total stadial period from I instar to adult ranged from 40 to 154 days. Males and females lived 52 and 36.5 days respectively. The sex ratio was slightly female biased. The insect preyed upon larvae of *Heliothis armigera* (Hbn.), *Spodoptera litura* F. and *Earias* spp.

KEY WORDS : *Oncocephalus annulipes,* biology predatory potential, *Heliothis armigera, Spodoptera litura, Earias* spp.

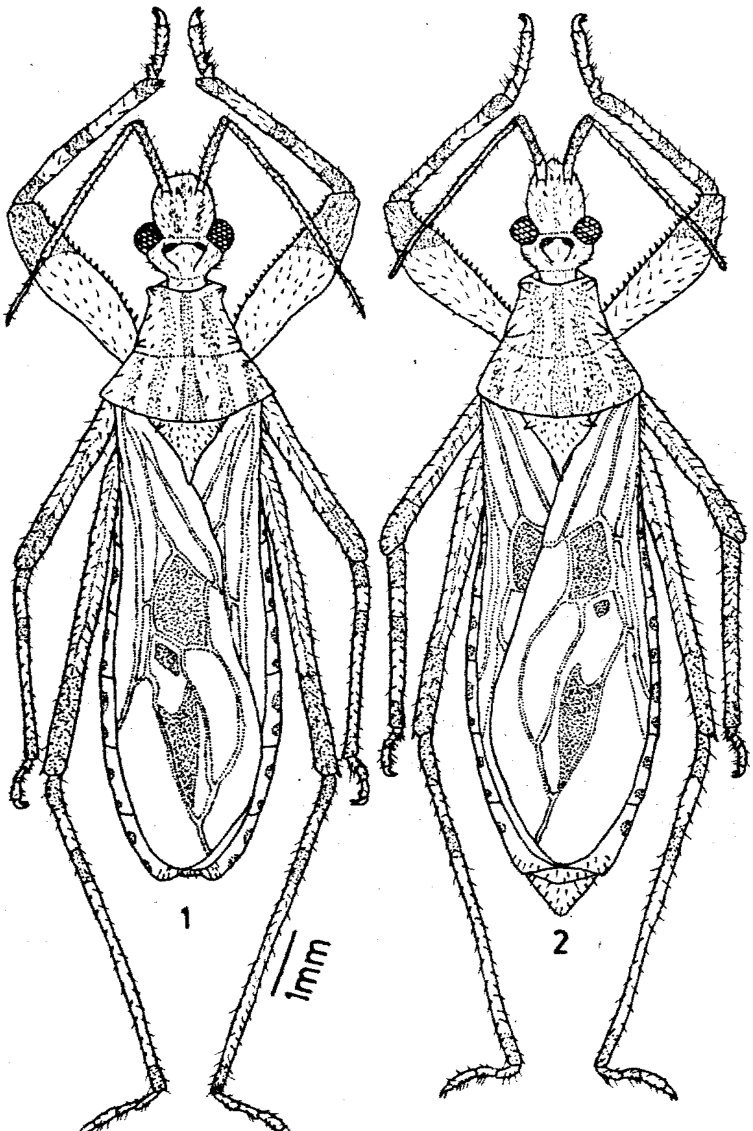

Fig. 1 & 2 *O. annulipes. male & female respectively*

Reduviids constitute an important group of predatory insects that could be successfully exploited in the biological pest management (Ambrose,1988). *Oncocephalus annulipes* Stal (Fig. 1a & b) is a reduviid predator feeding on caterpillars of insect pests, such as, *Heliothis armigera* (Hbn.), *Earias insulana* Boisdual, *E. vitella* Stoll and *Spodoptera litura* Fabricius and *Odontotermes obesus* Rambur etc. The biology and predatory potential of this bug has been worked out and the results are reported in this paper.

MATERIALS AND METHODS

Light-attracted adults of *O. annulipes* were collected and reared in the laboratory in plastic containers (6.5 cm height and 6 cm diameter) on grasshoppers (*Trilopidia* sp.), houseflies (*Musca domestica* L.) and caterpillars of *H. armigera, E. insulana, and E. vitella.* The different batches of eggs were allowed to hatch separately in plastic containers with wet cotton swabs for maintaining optimum RH (85%) separately. The cotton swabs were changed periodically in order to prevent fungal attack. The nymphs hatched were isolated in plastic containers and reared on the above mentioned preys. Observations on oviposition, incubation and stadial period, nymphal mortality, adult longevity and sex ratio were recorded. An index of oviposition days was calculated from the percentage of egg laying days in the total adult female life span (Ambrose, 1980).

TABLE 1 **Incubation and stadial periods, adults longevity (in days) and sex ratio of *O. annulipes***

Generation		Incubation period	Stadial period						I-Adult	Adult longevity		Sex ratio
			I	II	III	IV	V Male	V Female		Male	Female	Male : Female
I	Mean ±	19.75 ±	8.2 ±	7.0 ±	8.0 ±	9.6 ±	13.0 ±	-	45.8 ±	77.6 ±	-	
	SE	2.59	0.44	0.75	0.63	0.36	0.28		1.73	14.54		1 : 0
	n	4.00	5	5	5	5	5	-	5	5	-	
II	Mean ±	12.55 ±	15.55 ±	10.85 ±	14.45 ±	17.0 ±	-	37.43 ±	100.71 ±	-	27.43 ±	
	SE	0.89	1.23	0.96	1.09	0.3		11.42	12.62		8.19	0 : 1
	n	11.00	15	13	11	9	-	7	7	-	7.00	
III	Mean ±	13.44 ±	11.73 ±	10.5 ±	11.0 ±	13.0 ±	20.0	24.5	69.0 ±	27.0	45.5	
	SE	1.25	0.93	0.99	1.01	1.28			1.89			0.5 : 1
	n	9.00	15	12	7	4	1	2	3	1.	2.00	

Three generations were thus raised in the laboratory. Predatory efficiency was studied in the laboratory using both V instar nymphs as well as adults (both sexes) of the predator, *O. annulipes*, starved for 24 h. The caterpillars of *H. armigera, E. insulana, E. vitella* and *S. litura* were selected for the study since these were seen in abundance in the agroecosystems. The caterpillars were provided one after another in the individual rearing containers (6.5 cm height and 6 cm diameter) of the predator and the number of prey killed or preyed upon in 24 h period was recorded. Camera lucida illustrations were prepared from 70% ethanol-preserved specimens.

RESULTS AND DISCUSSION

The eggs were oval (0.92 ± 0.04 mm long (n=10) and 0.69 ± 0.05 mm broad (n=10) and pale luteous. Chorion was transparent with hexagonal sculpturations. The operculum (0.44 ± 0.05 mm long (n=10) and 0.07 ± 0.02 mm broad (n=10) was slightly concave and creamy white with linear sculpturations Fig.2a

O. annulipes laid its first batch of eggs 14 days (n=3) after emergence. Eggs were laid singly and not in clusters unlike the members of the subfamily Harpactorinae (Ambrose, 1980; and Haridass,

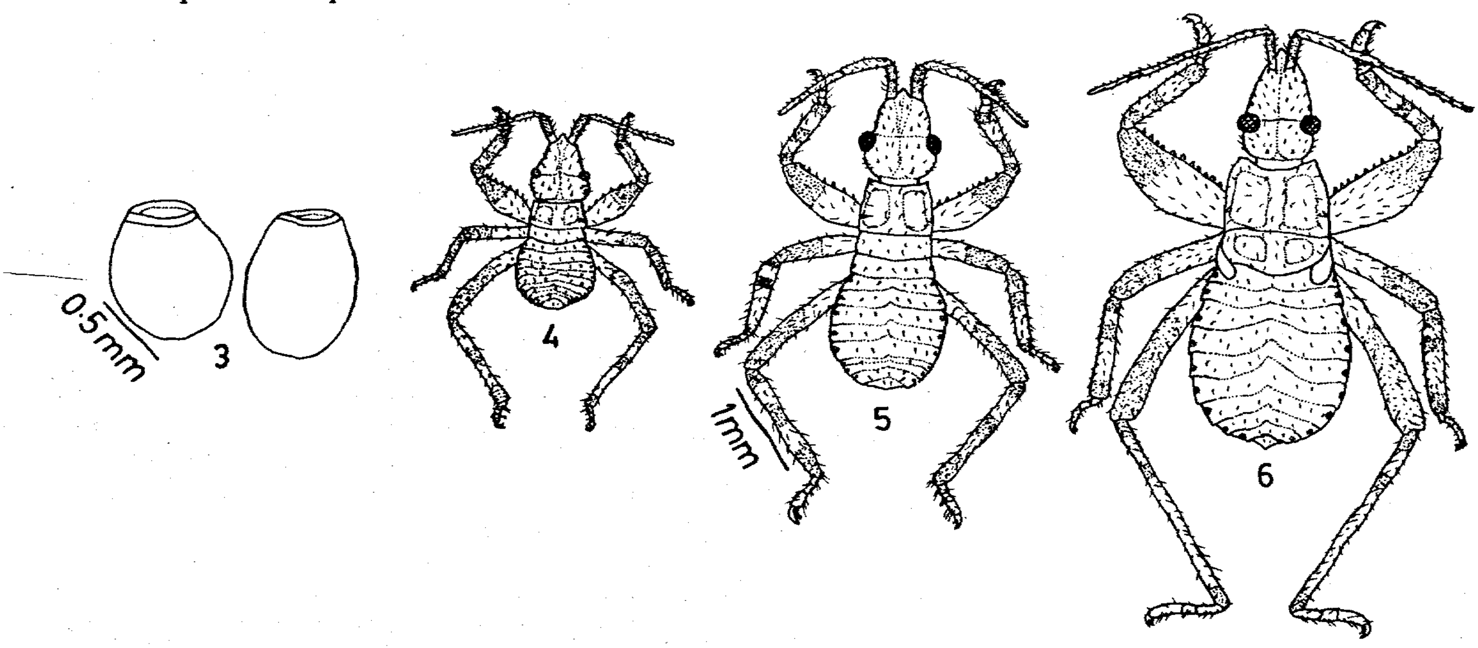

Fig. 3, 4, 5 & 6 O. annulipes. Egg and I to III nymphal instars respectively

1985). The eggs were inserted into the wet cotton swab. Parental care was not observed.

A female laid 14.9 batches of eggs (n=3). A minimum of 1 and a maximum of 8.7 (n=3) eggs per batch were recorded. Index of oviposition days was 25.83. Both 100% hatching and 0% hatching were registered in its different egg batches. Most of the eggs laid by the older females did not hatch as reported in *Triatoma phyllosoma pallidipennis* (Rabinovich, 1972). The unfertilized eggs were normal when laid but shrank afterwards.

Under laboratory conditions (temperature, 32°C; RH 80-85%; photoperiod 11-13 h), the eggs hatched in 7 to 24 days (n=24) (Table 1). Hatching invariably took place in the early morning from 4 to 6 a.m. Eclosion was similar to *E. slateri* (Vennison and Ambrose, 1986). The duration of eclosion was 5 to 10 min. The colour of the nymphs at eclosion was pale ochraceous and it changed into dark grey, with annulations in appendages, within 1 h. The nymphs did not probe the egg shells immediately after eclosion unlike *R. prolixus* (Breecher and Wigglesworth, 1944). The nymphs also did not exhibit any sign of hind leg movement, a compulsory act of camouflaging observed in the members of the subfamily Acanthaspidinae (Odhiambo, 1958a, 1958b;

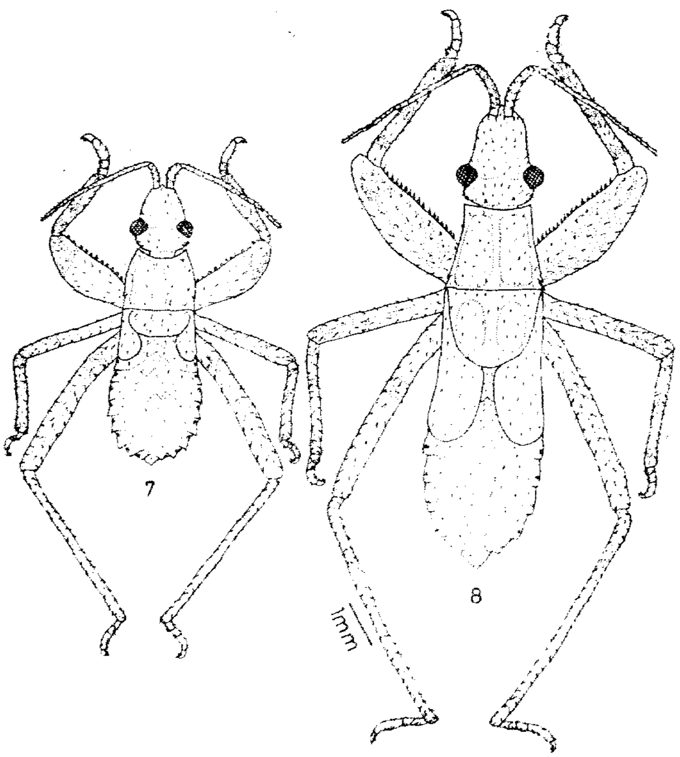

Fig. 7 & 8 *O. annulipes*. IV & V nymphal instars respectively

Livingstone and Ambrose, 1978; Ambrose, 1980, 1986). Nymphs started feeding 2 h after emergence. Nymphs preferred small and less active preys.

All the 45 nymphs observed in the laboratory for 3 generations moulted and emerged at night after 22 h. The stadial period of the I, II, III, IV and V instars lasted for 6 to 25 (n=35); 5 to 19 (n=30); 6 to 24 (n=23); 9 to 32 (n=18) and 11 to 102 (n=15) days respectively (Table 1). The total stadial period from I to V instar lasted for 40 to 154 days. The males emerged earlier than the females.

Early instars (I & II) grey and older instars (III to V) pale ochraceous; broad obsolete annulations on the scape, femorae, apex of rostrum and 3 annulations on the tibiae and abdominal marginal spot from 2nd to 9th segment fuscous; scarcely spinose throughout.

Head elongate; a transverse sulcus separating longer and porrect anteocular area from shorter postocular area in the synthlipsis; lateral margin of the postocular area rounded; large compound eyes laterally protruding; 2 median tubercles on the postocular area; 2 prominent antenniferous tubercles one at the base of each antenna; 3 lateral tubercles on the gena; head scarcely spinose; antennae 4 segmented, scape stout and as long as anteocular portion, pedicel twice the length of scape and the longest; the flagellar segments filiform and subequal in length; rostrum bow shaped, slightly curved 1st and more curved 2nd segments subequal in length; 3rd segment the smallest and straight.

Pronotum transverse antero-and posterolateral angles of anterior lobe of pronotum tuberculate and also two lateral tubercles on anterior lobe of pronotum, pterothorax infuscate except in the ecdysial line; anterior femorae incrassated and ampliated and bear a row of tubercles ventrally; fore-and mid legs equal in length and the hind leg slender and the longest; tibiae devoid of tibial pads; broad obsolete annulations on the femorae and 3 annulations on the tibiae; tarsus 3 segmented with differentially developed hairs.

Abdomen oval in early instars and elongate in older instars; segmentation clear in the abdomen and the integument finely spinulose; 2nd to 9th abdominal segments bearing a small fuscous spot on the lateral edges (Figs. 2b, c, d & 3a, b).

Key to nymphal instars

1. Compound eyes small, not laterally protruded; pedicel shorter than 2nd flagellar segment; width of abdomen equals its length .... I INSTAR
   Compound eyes large, laterally protruded; pedical longer than 2nd flagellar segment; width of abdomen shorter than its length .... (2)

2. Length of scape and pedicel together equal the length of flagellar segments; wing rudiments not visible .... II INSTAR
   Length of scape and pedicel together greater than the length of flagellar segments; wing rudiments visible ....(3)

3. Anteocular area equals the length of anterior pronotal lobe; wing rudiments not extending beyond the 1st abdominal segment .... III INSTAR
   Anteocular area shorter than the anterior pronotal lobe; wing rudiments extending beyond the 1st abdominal segment...(4)

4. Length of scape equals 1st flagellar segment; head length equals pronotal length; wing rudiments developing up to 2nd abdominal segment .... IV INSTAR
   Scape longer than 1st flagellar segment; head shorter than pronotal length; wing rudiments developing up to 4th abdominal segment ....V INSTAR

Nymphal mortality was mainly due to the abnormalities in hatching and moulting. Cannibalism also caused nymphal mortality. The highest rate of nymphal mortality was observed in the III instar (10.68%) and the lowest in V instar (3.7%). I,II and IV instar registered 7.64%, 4.44% and 6.06% nymphal mortality respectively.

The males and the females lived 52 and 36.5 days respectively. Of the three generations raised in the laboratory, 6 males and 9 females emerged, giving the sex ratio of males and females as 0.7:1. Laboratory breeding experiments suggested that *O. annulipes* was multivoltine.

O. annulipes preyed or killed 1 to 3 ($\bar{x}$ = 1.8; n = 6) caterpillars (size 20 - 25 mm long and 2 -3 mm broad) of *H. armigera*; 2 to 3 ($\bar{x}$ = 2.5 and 2.2 respectively; n=6) caterpillars (size 10-15 mm long and 2-3 mm broad) of both *E. insulana* and *E. vitella*; and 1 to 3 ($\bar{x}$ = 2.2; n=6) caterpillars (size 15-20 mm long and 2-3 mm broad) of *S. litura* in the laboratory.

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